DOCUMENT RESUME

ED 109 184 TM 004 634

AUTHOR	Powers, Donald
TITLE	The Virginia Beach Extended School Year Program and Its Effects on Student Achievement and Attitudes--First Year Report.
INSTITUTION	Educational Testing Service, Princeton, N.J.
SPONS AGENCY	Virginia Beach City Public Schools, Va.
REPORT NO	ETS-PR-74-24
PUB DATE	Oct 74
NOTE	54p.; For related documents, see TM 004 605, 606, 607, 608 and EA 007 069, 070, 071 and 072
EDRS PRICE	MF-$0.76 HC-$3.32 PLUS POSTAGE
DESCRIPTORS	*Academic Achievement; Achievement Tests; Aptitude Tests; Comparative Analysis; Educational Assessment; Educational Innovation; Elementary Education; Experimental Programs; *Program Evaluation; *Student Attitudes; *Testing; *Year Round Schools
IDENTIFIERS	*Virginia Beach 45 15 Pilot Program

ABSTRACT

The Virginia Beach City School System has utilized an experimental school year plan known as 45-15. Under this plan, schools remain in session throughout the year and students are assigned to one of four attendance cycles which begin 15 days apart. As a result of the staggered attendance pattern, only three groups (cycles) of students are in attendance at any particular time. The primary purpose of this evaluation was to assess the possible negative side-effects of the new attendance schedule by focusing on student achievement and student attitudes at the end of the first year of year-round education. General conclusions are that students in the fourth, fifth, and sixth grades in pilot schools suffered no adverse effects on achievement in reading or mathematics, nor on attitudes toward learning or school, as a result of year-round schooling. Specifically, data suggests that sixth grade students improved in reading and mathematics, while their attitudes toward learning and school were more positive. Students with poor attitudes toward learning and towards school and relatively high ability students seemed to benefit from year-round schooling. Findings suggest continuance or expansion of year-round education at Virginia Beach. (Author/BJG)

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THE VIRGINIA BEACH EXTENDED SCHOOL YEAR PROGRAM AND ITS EFFECTS ON STUDENT ACHIEVEMENT AND ATTITUDES - FIRST YEAR REPORT

Submitted by Donald Powers,
Principal Investigator

to

Virginia Beach City
Public School District,
Virginia Beach, Virginia

October, 1974

EDUCATIONAL TESTING SERVICE
PRINCETON, NEW JERSEY

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I. INTRODUCTION

A. Background

School systems have expressed a variety of reasons for experimenting with or implementing year-round (or extended) school year schedules. These reasons include improvement or reorganization of curricula, tax savings, and better utilization of school facilities. In addition, a number of proponents of year-round schools believe that there are other positive side-effects of year-round scheduling. A variety of academic (e.g., better retention of subject matter), economic (e.g., increased earning potential for teachers), and sociological side-effects (e.g., broader recreational opportunities) have been claimed. Whatever the reasons for, or the effects of, year-round education, however, the idea appears to be spreading. A recent survey (Campbell, 1973), for example, cited twelve distinct types of year-round programs and 42 operational programs throughout the country. An even greater number of planning or feasibility studies have been conducted.

The Virginia Beach City School System's reason for experimenting with year-round education was straightforward. As a result of continuing rapid growth and several failures to pass bond issues, the Virginia Beach School Board decided to experiment with the extended school year concept as a potential answer to its rapidly increasing space shortages. The established objective was simply to provide space for more students.

The extended school year plan that was selected was the one popularly known as "45-15." Under the plan schools remain in session throughout the year. Students are assigned to one of four attendance cycles which begin 15 days apart. Each group attends school for 45 class days and then receives a 15-school-day vacation. This pattern is repeated four times

during the year so that each group completes a 180-day school year. As a result of the staggered attendance pattern only three groups (cycles) of students are in attendance at any particular time. Thus schools are able to accommodate one-third more students.

B. Pilot Study

Four Virginia Beach elementary schools were designated to test the "45-15" plan over a two-year period for potential district-wide adoption. Criteria for adoption of the plan were established in three areas: (1) effects on the community, (2) costs, and (3) effects on students. Separate studies have been commissioned for each of these areas. The subject of this report is the third of the three areas.

C. Evaluation

As was mentioned above, the objective of the "45-15" plan was to provide additional space. Since the staggered attendance pattern has, in fact, been implemented, the objective has been accomplished. The purpose of this evaluation is, primarily, the assessment of possible negative side-effects of the new attendance schedule. Specifically, it was postulated that there would be no detrimental effects on student achievement or student attitudes as a result of the plan. The evaluation described in the following pages is an attempt to assess these effects.

No attempt was made in the present evaluation to gather evidence related to all of the various claims that have been made for year-round education. For example, the effects of the year-round schedule on retention of subject matter and amount of review time required could not be adequately addressed because of various constraints.

Among the weaknesses of this evaluation is the program-description component. No attempt was made to document the various changes that accompanied the new attendance schedule, for example, although these concomitant changes may have been quite important. These changes included the use of multi-age grouping procedures and reorganization of the curriculum into units more suited for year-round scheduling. In addition, teachers were allowed to request transfers to and from the four year-round schools depending on their preferences for that type of schedule.

II. THE SAMPLE

A. Initial Selection of Schools

Initially, the Virginia Beach School Board considered eleven elementary schools for possible participation in the 45-15 plan. Enrollments for the 1973-74 school year were projected for each of these schools using previous actual and projected enrollments, school census data, and projected increases from new housing during the 1973-74 school year. Projected enrollments were then compared with school building capacities for each of the schools. On the basis of these comparisons four of the eleven schools were selected to participate in the 45-15 pilot program. The decision to select these four schools was based not only on the fact that projected enrollments were near or greater than capacity but also on the location of these schools. The fact that the four schools are located in a relatively compact geographic area was thought to facilitate implementation and administration of the plan.

Two of the eleven schools which received preliminary consideration were designated as control schools. These schools are also located in the same geographic area as the pilot schools. Their projected enrollments were also near maximum program capacity.

B. Selection of Grades

Because of the limited funding and since there was reason to believe that, with the exception of first grade, the 45-15 plan would affect all grades similarly, the study was limited to a fourth-grade and a first-grade sample. The first grade was selected since the change in age at which pupils begin school* under the 45-15 plan might be particularly important at this

*Under the 45-15 plan children begin school in the early summer instead of fall.

level. The fourth grade was selected because it was thought to be representative of the remaining (2-6) grade levels and because testing capabilities are optimized at this level. A longitudinal study of 1972-73 fourth-graders, as well as a time-lag study using statewide assessment data, was possible over the two-year duration of the evaluation.

C. Selection of Students within Schools

At the fourth-grade level students were sampled from each of the four pilot schools. A systematic sample was drawn from the classroom rosters of each school. In order to obtain pilot-and control-group samples of nearly equal size, slightly more than one-third of the students in each pilot-school classroom were selected. All fourth-grade students in the two control schools were included in the sample. The sampling procedure employed was believed to have resulted in a sufficiently large sample (over 400 students divided approximately equally between pilot and control schools) to (1) test for differences between pilot and control groups, (2) test for differences among pilot-group attendance cycles, and (3) withstand anticipated sample mortality. The number of fourth-grade students tested in pilot and control schools in '73 and the number of these who remained to be tested as fifth-graders in '74 appear in Table 1. As can been seen, the sample diminished by approximately one-third for each group. Figures for pilot schools (1974) reflect the absence of students in the third attendance cycle, since these students were on vacation when testing was conducted.

Table 1

Number of Fourth (or Fifth) Grade Students
Tested in Pilot and Control Schools
in 1973 and 1974

Year	Pilot	Control
Spring 1973	212	235
Spring 1974	133	158

At the first-grade level all students in each of the pilot and control schools were included in the sample, since use of data from the district-administered testing program made data collection less expensive at this level. Useable first-grade data were available for 277 pilot-school students and for 162 control-school students.

III. INSTRUMENTS

A. Description

A variety of information was collected in order to answer the evaluation questions of interest at the fourth-through sixth-grade levels. This information consisted of aptitude, achievement, and attitudinal data. Aptitude data were derived from the School and College Ability Test (SCAT), which provides estimates of basic verbal and mathematical ability. The verbal section of the test is composed of 50 verbal analogy items, while the math section contains 50 quantitative comparison items.

Achievement data were obtained from two sources. The Reading and the Mathematics Basic Concepts tests of the Sequential Tests of Educational Progress (STEP) were administered in order to obtain achievement estimates in these basic skill areas. The STEP Reading test contains two sections, which measure the ability to read and understand a variety of materials. Items are classified as tapping three skill areas: comprehension, translation and inference, and analysis. The STEP Mathematics Basic Concepts test measures three abilities in a number of mathematics content areas. According to the test manual, the examinee is required to:

(1) recall facts and/or perform mathematical manipulation,

(2) demonstrate comprehension of mathematical concepts, and

(3) exercise ingenuity or higher mental processes.

The second source of achievement data was the statewide testing program, which uses the SRA Assessment Survey Edition of the Iowa Tests of Educational Development (ITED). Data from only the Reading and the Mathematics subtests were used. The former contains vocabulary as well as comprehension items; the latter includes both mathematical concepts and

computation items.

Measures used to assess student attitudes were two scales developed by the Institute for the Development of Educational Activities (IDEA). One, Attitude Toward School (ATS), has been designed to measure the child's general attitude toward school and his enjoyment of the school situation; the other, Attitude Toward Learning (ATL), is, according to the technical manual, a measure of the child's orientation toward learning in school as well as his general interest in finding out about the world both in and out of school.

At the first-grade level, Metropolitan Readiness Test (MRT) scores were collected. The six tests included in the MRT (word meaning, listening, matching, alphabet, numbers, and copying) are intended to indicate the extent to which beginning students have developed in the abilities thought to contribute to readiness for first-grade instruction.

B. Reliability of Instruments

Coefficient alpha reliability estimates (Table 2) were computed for each of the measures administered especially for the extended school year evaluation. Estimates are, in general, comparable to estimates given in the technical manuals of each instrument. In each case reliability is sufficiently high to allow accurate estimation of group means in each of the analyses conducted for this evaluation.

Table 2

Reliability Estimates by Subtest for Total Sample

Year	SCAT Verbal	SCAT Quant.	STEP Reading	STEP Math	Attitude School	Attitude Learning
Spring '73	.86	.81	.89	.85	.93	.80
Spring '74	-	-	.88	.89	.91	.78

C. Content Validity of Instruments

Since each of the achievement measures used in the evaluation was a standardized instrument designed to measure broad, general goals, there was the possibility that the instruments might not be very good measures of the particular goals and objectives of Virginia Beach Schools. In order to estimate the appropriateness of the STEP measures, in terms of the match between teacher objectives and test items, teachers in each pilot and control school whose students were tested were asked to rate each STEP item with respect to the importance of the skill tested by the item and the emphasis which she had placed on the skill during the academic year.

The instructions given to teachers specified that they were to think of the skill or content tested by each item in relation to the skills or content which they had felt were important or had emphasized during the school year, and to rate each item on two five-point scales ranging from "well below average" to "well above average." Table 3 contains average (over teachers and items) importance and emphasis ratings for each subtest, year, and treatment group.

Table 3

Teacher Ratings for STEP Subtests

1973

Group	Reading I		Reading II		Math Basic Concepts	
	Imp.	Emp.	Imp.	Emp.	Imp.	Emp.
Pilot N=18	3.0	2.9	3.4	3.3	3.1	2.6
Control N=9	2.8	2.5	3.1	2.8	3.1	2.3

1974

Group	Reading I		Reading II		Math Basic Concepts	
	Imp.	Emp.	Imp.	Emp.	Imp.	Emp.
Pilot N=28	3.7	3.5	3.8	3.6	3.5	3.0
Control N=5	3.3	3.3	3.8	3.7	3.4	3.2

Well below average = 1
Below average = 2
About average = 3
Above average = 4
Well above average = 5

Several of tne 1973 ratings were relatively low, particularly the emphasis ratings for math basic concepts. The ratings of pilot school teachers were somewhat higher than those of control school teachers.

Ratings for 1974 are of most concern in the present evaluation since fifth grade achievement is the criterion of interest. For these ratings, each average was relatively high and in each case, higher than the corresponding 1973 average. All of the 1974 averages were between three (about average) and four (above average). In addition, there were only very slight differences between the ratings of pilot-school and control-school teachers.

Only summary statistics have been discussed for teacher ratings. There were, of course, interesting differences among items and teachers. The ratings themselves have been shown to be at least somewhat valid by virtue of their correlation with the end-of-year achievement test scores of students in the sample.

IV. EVALUATION DESIGN

As mentioned above, the extended school year evaluation entailed two separate studies -- one at the first-grade level and one at the fourth-grade level. The basic data collection plans for each of these studies are presented in Figures 1 and 2. The arrows in each figure indicate the repeated testing of a particular group of students. Table 4 lists the variables considered in each of the evaluation studies. All data were collected from pilot schools and control schools.

A. First-Grade Study

At the first-grade level, the Metropolitan Readiness Test scores of all 1973-74 first-grade students in pilot and control schools were collected. Tests were administered by classroom teachers (as part of the regular district testing program) to beginning first-grade pupils. The evaluation question which these data were intended to answer was:

> What is the effect on readiness of the early beginning necessitated by the year-round school schedule?

When they first begin school, first-cycle year-round students can be expected to be younger than students in traditionally scheduled schools, since they have an early-summer (June 18 for the '73-74 school year) instead of a traditional early-fall beginning (Sept. 4 for the '73-74 year). Since, as the Metropolitan Readiness Test (MRT) technical manual states, "The progress young children make when they enter school in the primary grades depends to a large extent upon their readiness for learning...," it was felt that the evaluation should include an assessment of first-grade readiness.

Although the MRT technical manual provides some data which suggest that younger children are less ready for instruction, it provides no information as to how much difference in readiness can be attributed to specific age

Figure 1

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Test Data Collection Plan for the
Virginia Beach Extended School Year Evaluation (Fourth-Grade Study)

Grade	Spring '73	Spring '74	Spring '75
4	ITED Math * ITED Reading * SCAT 4A STEP Reading 4A STEP Math Basic Concepts 4A IDEA Attitude Toward School (form A) IDEA Attitude Toward Learning (form A)	ITED Math * ITED Reading *	ITED Math * ITED Reading *
5		STEP Reading 4B STEP Math Basic Concepts 4B IDEA Attitude Toward School (form B) IDEA Attitude Toward Learning (form B)	
6	ITED Math * ITED Reading *	ITED Math * ITED Reading *	ITED Math * ITED Reading * SCAT 4B STEP Reading 4A STEP Math Basic Concepts 4A IDEA Attitude Toward School (form A) IDEA Attitude Toward Learning (form A)

* Data from Statewide Assessment Program

Figure 2

Test Data Collection Plan for the
Virginia Beach Extended School Year Evaluation (First-Grade Study)

Grade	Summer - Fall '73	Summer - Fall '74
1	Metropolitan Readiness Test (MRT)	
2		Kuhlman - Anderson Intelligence Test

Table 4
-13-
List of Variables

First-Grade Study	
'73 Metropolitan Readiness Test Score	(MRT)
Age at time of MRT administration	(AGE)
Sex	(S)
Previous Kindergarten Experience	(KEXP)
'74 Kuhlman-Anderson Intelligence Test Score	(IQ)
Longitudinal Study (Fourth - Fifth)	
'73 School and College Ability Test Score (form 4A)	(SCAT)
Verbal	(SCAT-V)
Quantitative	(SCAT-Q)
'73 Sequential Tests of Educational Progress (form 4A)	(STEP)
Reading	(STEP-R)
Mathematics Basic Concepts	(STEP-M)
'73 Institute for the Development of Educational Activities (IDEA) Attitude Scales (form A)	
Attitude Toward School	(ATS)
Attitude Toward Learning	(ATL)
'74 Sequential Tests of Educational Progress (form 4B)	(STEP)
Reading	(STEP-R)
Mathematics Basic Concepts	(STEP-M)
'74 Institute for the Development of Education Activities (IDEA) Attitude Scales (form B)	
Attitude Toward School	(ATS)
Attitude Toward Learning	(ATL)
'73 Fourth-Grade Teacher Ratings of STEP Items (form A)	(TR)
'74 Fifth-Grade Teacher Ratings of STEP Items (form B)	(TR)
Number of school days attended at time of '74 test administration	(SCHOOL DAYS)
Time-Lag Study (Fourth - Sixth)	
'73 Iowa Tests of Educational Development (fourth and sixth grades)	(ITED)
Reading	(ITED-R)
Mathematics	(ITED-M)
'74 Iowa Tests of Educational Development (fourth and sixth grades)	(ITED)
Reading	(ITED-R)
Mathematics	(ITED-M)

differences; e.g., the expected 2-3 month difference between first-cycle year-round students and those in traditional schools. In order to determine the relationship of age to readiness, readiness scores have been tested for differences across specified age divisions. Previous kindergarten experience has also been considered as a factor in assessing these readiness differences. In addition, next year's analysis will take into account the intelligence test scores of students.

B. Fourth-Grade Study

The major effort in the present evaluation was expended at the fourth-grade level. Both a time lag (i.e., the comparison of student performance from year to year for a particular grade level) and a longitudinal study (i.e., the comparison of student performance from year to year for a particular group of students) were designed. The former utilized fourth-and sixth-grade data (Iowa Tests of Educational Development) collected as part of the statewide assessment program, while the latter used specially collected achievement (STEP), aptitude (SCAT), and attitudinal data on a fourth-grade sample which is being followed through the sixth grade. Figure 1 presented above depicts the data collection plan that is being implemented at this level. Collection of these data was intended to answer the following questions:

(1) What are the effects on student achievement in mathematics and reading of the year-round school schedule?

(2) What are the effects on student attitudes toward school and toward learning of the year-round school schedule?

(3) What are the effects on student achievement and attitudes of attending different year-round attendance cycles?

(4) Are there interactions between particular student traits, such as student ability, and type of school schedule (e.g., is aptitude level related to the type of schedule under which students perform most effectively)?

The data collection design permitted independent assessments of treatment effects from two different data sources, as well as the opportunity to replicate findings using data from subsequent years.

V. RESULTS

A. Longitudinal Analysis

1. The Sample

The sample of students who were tested as fourth-graders in the spring of 1973 were tested again during the following spring. Table 1, presented above, showed the numbers of students originally tested in 1973 and the numbers of these who were tested the following year. Table 1 shows that both baseline (1973) and first-year (1974) criterion data were available for 133 pilot school students and 158 control-school students. Of the 133 students in pilot schools, 37 were assigned to cycle A, 53 to cycle B, and 43 to cycle D. All longitudinal analyses are based on these matched data, i.e., on students who were present for both testings. An attrition rate of approximately one-third for each of the groups was about what was anticipated. The slightly higher rate for the pilot group can be attributed to the absence of third-cycle students during the Spring '74 testing.

2. Comparability of Treatment and Control Groups

Table 5* shows that students in the pilot group were slightly more able than control group students on both verbal and quantitative ability as measured by the School and College Ability Tests (SCAT). When compared to control school students, pilot school students also had significantly higher achievement scores on both STEP Reading and STEP Math (Tables 6 and 7) at the beginning of the treatment period (i.e., Spring '73). These initial group differences in aptitude and achievement justified original analysis plans of adjusting for possible differences between pilot and control groups

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*All Tables in this report showing achievement estimates contain raw score means with standard deviations in parentheses.

on these variables. There were also very slight initial differences between the two groups on the attitudinal measures (Tables 8 and 9).

Table 5

Status of Pilot and Control Groups on Pre-Treatment Ability Measures

Group	Spring '73 SCAT Verbal	Spring '73 SCAT Quantitative
Pilot N = 133	25.1 (8.8)	26.1 (7.7)
Control N = 158	23.6 (8.0)	24.3 (7.7)

Table 6

STEP Math Basic Concepts Achievement Estimates (Matched Longitudinal Data)

Group	Spring '73	Spring '74	Adjusted* Spring '74	p
Pilot N = 133	23.1 (8.5)	28.9 (9.6)	27.7	N.S.
Control N = 158	20.9 (7.4)	26.6 (9.0)	27.6	

*For initial differences on SCAT Quantitative, Spring '73 STEP Math, and number of days in school

Table 7

STEP Reading Achievement Estimates (Matched Longitudinal Data)

Group	Spring '73	Spring '74	Adjusted* Spring '74	p
Pilot N = 133	32.8 (9.8)	35.0 (9.6)	33.7	N.S.
Control N = 158	29.4 (10.4)	33.0 (9.5)	34.2	

*For initial differences on SCAT Verbal, Spring '73 STEP reading, and number of days in school

Table 8

IDEA Attitude Toward School (Matched Longitudinal Data)

Group	Spring '73	Spring '74	Adjusted* Spring '74	p
Pilot N = 133	79.3 (21.0)	78.9 (15.7)	79.1	$p < .001$
Control N = 158	80.3 (22.0)	72.1 (19.9)	72.0	

*For initial differences on Spring '73 Attitude Toward School

Table 9

IDEA Attitude Toward Learning (Matched Longitudinal Data)

Group	Spring '73	Spring '74	Adjusted* Spring '74	p
Pilot N = 133	82.8 (14.4)	87.2 (12.9)	87.0	N.S.
Control N = 158	81.6 (17.3)	86.9 (11.9)	87.0	

*For initial differences on Spring '73 Attitude Toward Learning

3. Comparability of Students Attending Different Attendance Cycles within Pilot Schools

Tables 10, 11, and 12 show that cycle B students (i.e., those cycle B students for whom both baseline and criterion data were available) were, initially, slightly superior to both cycle A students and cycle D students on each of the aptitude and achievement measures. Cycle A students scored lowest of the three groups on each of the measures. Students in the D cycle tended to score slightly higher on the attitudinal measures.

These initial differences in achievement and attitude among the three attendance cycle groups are functions of the method of assignment to attendance cycle and the numbers in each school attending different cycles. That is, students were assigned to cycles on the basis of the neighborhood in which they lived. Also, there were sometimes rather large differences from school to school in the proportions of students assigned to the various cycles.

4. Between-Group Differences

All the end-of-first-treatment-year differences between pilot-and control-school students were assessed by first adjusting for initial group differences on an alternate form of the same instrument. In addition, achievement estimates were adjusted for initial group differences on an appropriate aptitude measure (verbal for reading, quantitiative for math) as well as the number of school days in session at the time of the '74 testing. Table 13 shows the number of days in session for students in pilot-school attendance cycles and for those in control schools. Control-school students averaged slightly more days in school than pilot-school students (155 to 147) when they were tested. The days-in-school variable, however, was not significantly related to any of the criterion variables.

Table 10

STEP Math Basic Concepts Achievement Estimates for 45 - 15 Cycles

Cycle	Spring '73	Spring '74	Adjusted* Spring '74	p
A N = 37	22.4 (7.9)	27.3 (9.0)	28.4	N.S.
B N = 53	24.2 (8.2)	30.2 (9.5)	29.0	
D N = 43	22.5 (9.2)	28.6 (10.1)	29.1	

*For initial differences on SCAT Quantitative and Spring '73 STEP Math

Table 11

STEP Reading Achievement Estimates for 45 - 15 Cycles

Cycle	Spring '73	Spring '74	Adjusted* Spring '74	P
A N = 37	30.6 (9.6)	33.5 (7.7)	35.4	N.S.
B N = 53	34.1 (9.7)	35.6 (10.5)	34.4	
D N = 43	33.1 (9.8)	35.6 (9.8)	35.4	

*For initial differences on SCAT Verbal and Spring '73 STEP Reading

Table 12

Status of 45 - 15 Cycles on Pre-Treatment Ability Measures

Cycle	Spring '73 SCAT Verbal	Spring '73 SCAT Quantitative
A N = 37	22.6 (8.2)	24.5 (7.8)
B N = 53	26.8 (8.9)	27.5 (8.3)
D N = 43	25.1 (8.6)	25.8 (6.6)

Table 13

Number of Days in Session at Time of '74 Testing

Pilot Schools			Control Schools
Cycle A	Cycle B	Cycle D	
163	148	133	155

a. Math Basic Concepts

Table 6 shows that, at the end of the first year of "45-15," pilot-school students retained their slight superiority in mathematics achievement over control school students. After adjusting for initial differences in quantitative ability, mathematics achievement, and number of days in school, however, there was virtually no difference at all between the pilot and control groups.

b. Reading

Students in pilot schools also retained their initial advantage over control school students with regard to reading achievement. Table 7 shows, however, that adjusting for initial differences in verbal ability, reading achievement, and number of days in school eliminated the pilot group's advantage. The slight difference in the adjusted Spring scores (in favor of the control group) was not significant.

c. Attitude Toward School

A significant difference ($p < .001$) in favor of pilot-school students (Table 8) was detected on the Spring Attitude Toward School measure. This fairly large difference (7 points) remained significant after adjusting for slight initial group differences on the Attitude Toward School measure. While it is not possible to say that the "45-15" program was responsible for this difference in student attitudes toward school, the program must be regarded as a likely cause.

Examination of differences between the responses of pilot-and control-group students to individual items shows that pilot students obtained more positive scores on all but one of the 25 items on the Attitude Toward School questionnaire. Twelve pertain to school in general, five to teachers, five to school subjects, and one each to school personnel, classroom, and peers. Approximately half of the seven-point ATS difference between control and pilot groups can be accounted for by differences on seven of the twenty-five items. Three of these items are teacher-related while four others pertain to general attitudes toward school. Since there are only five items on attitudes toward teachers, it seems significant that rather large differences should occur on three of these items.

d. Attitude Toward Learning

Table 9 shows that mean differences between the Attitude Toward Learning scores of students in pilot schools and those in control schools were extremely small on both Spring testings. Adjusted means for the two groups were, in fact, identical.

5. Differences among Attendance Cycles

As was stated above, there were slight and consistent differences among attendance cycles with respect to achievement and attitude. After adjustments were made for initial differences in aptitude and achievement, however, Spring '74 achievement differences among cycles in both reading and mathematics were reduced. None were significant.

With respect to the attitudinal measures, adjustments on the basis of initial scores yielded no significant differences among cycles. It is interesting to note, however, that Table 14 shows a moderate difference favoring A-cycle students over those in D cycle. A substantial portion of the significant difference noted above between the attitudes of pilot and

control students toward school can, therefore, be attributed to the higher scores of cycle A students. There were no significant differences among cycles on the Attitude Toward Learning measure (Table 15).

Table 14

IDEA Attitude Toward School for 45 - 15 Cycles

Cycle	Spring '73	Spring '74	Adjusted* Spring '74	p
A N = 37	77.0 (22.0)	80.1 (12.7)	80.9	N.S.
B N = 53	77.3 (22.0)	79.1 (18.2)	79.8	
D N = 43	83.7 (18.0)	77.6 (14.5)	76.1	

*For initial differences on Spring '73 Attitude Toward School

Table 15

IDEA Attitude Toward Learning for 45 - 15 Cycles

Cycle	Spring '73	Spring '74	Adjusted* Spring '74	p
A N = 37	82.3 (15.8)	87.0 (10.7)	87.2	N.S.
B N = 53	80.8 (15.1)	86.3 (15.7)	87.0	
D N = 43	85.6 (11.5)	88.6 (10.3)	87.5	

*For initial differences in Spring '73 Attitude Toward Learning

B. Time-Lag Analysis

As stated above, the data for the analysis that can best be termed time-lag were obtained from the statewide testing program. Under the program the Iowa Tests of Educational Development are administered to fourth- and sixth-grade students each spring. The analysis that was conducted using these data has been referred to as a time-lag analysis, since it consists primarily of across-years, within-grade comparisons.

That is, for a given grade (either 4th or 6th) achievement estimates are compared from year to year for both the control and the pilot groups. A major weakness of this type of comparison is that achievement estimates are based on different groups of students. Differences between the achievement of 1973 fourth graders and 1974 fourth graders could be attributed to initial differences between the groups rather than between-year differences in school processes (or effectiveness). The longitudinal study was designed to counteract this weakness by following the progress of a particular group of students.

Table 16 shows the number of students for whom data were available for the time-lag analysis. The numbers represent, essentially, every student in the fourth and sixth grades in the four pilot and two control schools in 1973 and 1974. From Table 16 it is clear that there were slight increases from 1973 to 1974.in the number of students at each of the grade levels for pilot as well as control schools. The only sizable increase (17%) occurred for pilot-school sixth-graders. It is conceivable that this increase could indicate a changing population at this grade level in pilot schools. A change of this nature could account, at least partially, for between-year achievement differences for this group.

Table 16

Number of Students for Whom Statewide Assessment Data Were Available

	Fourth Grade		Sixth Grade	
	1973	1974	1973	1974
Pilot	565	584	552	645
Control	236	252	235	251

Mean achievement estimates for the ITED Statewide Assessment data for pilot and control groups appear in Tables 17 and 18. These estimates are unweighted averages of school means. Graphic displays of these estimates appear in Figures 3, 4, 5, and 6.

Table 17

Time-Lag Data for ITED Reading

	Fourth Grade		Sixth Grade	
	1973	1974	1973	1974
Pilot	272.2	274.7	331.6	338.6
Control	261.5	263.0	327.3	322.1

Table 18

Time-Lag Data for ITED Math

	Fourth Grade		Sixth Grade	
	1973	1974	1973	1974
Pilot	267.5	269.6	331.5	336.3
Control	264.0	266.5	325.2	318.6

Figure 3

-26-

Fourth-Grade Time-Lag Data for ITED Reading

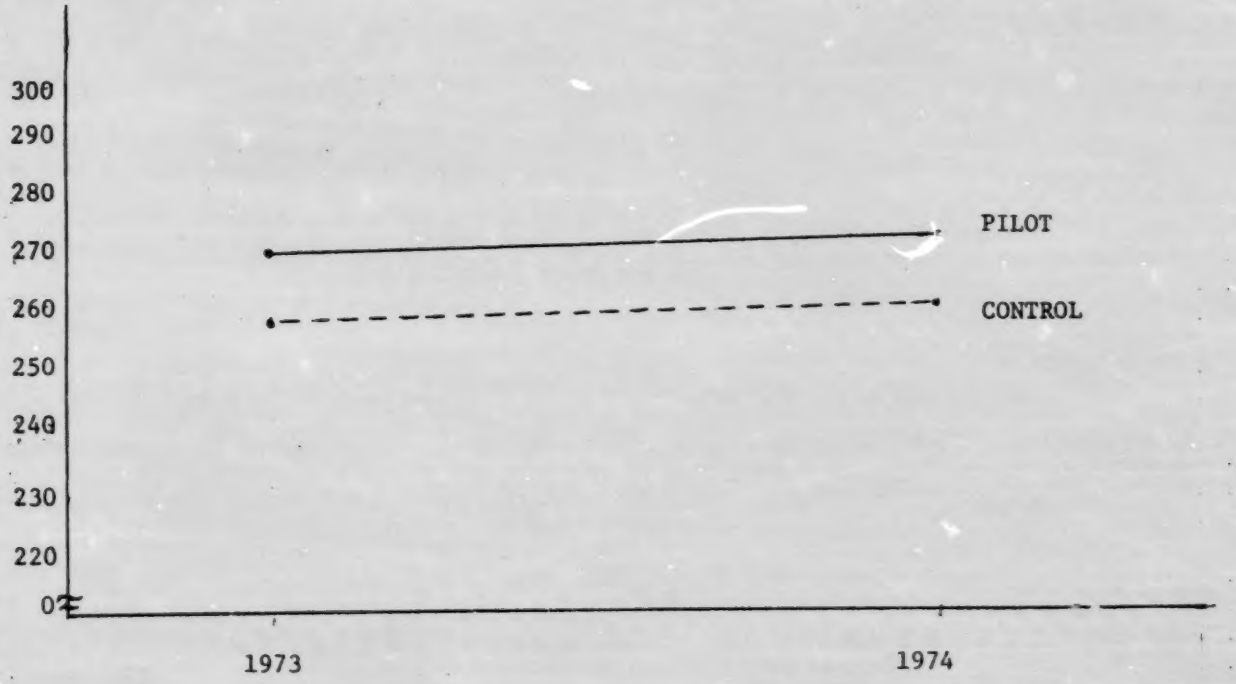


Figure 4

Fourth-Grade Time-Lag Data for ITED Math

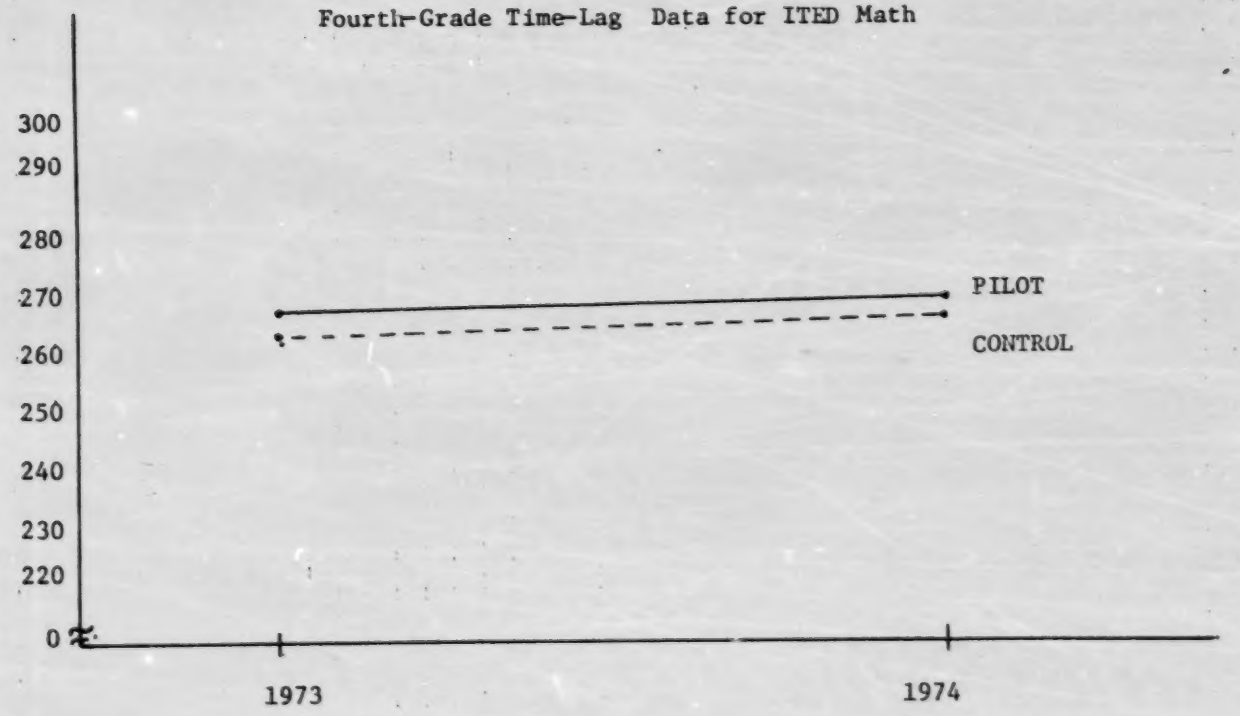


Figure 5
Sixth-Grade Time-Lag Data For ITED Reading

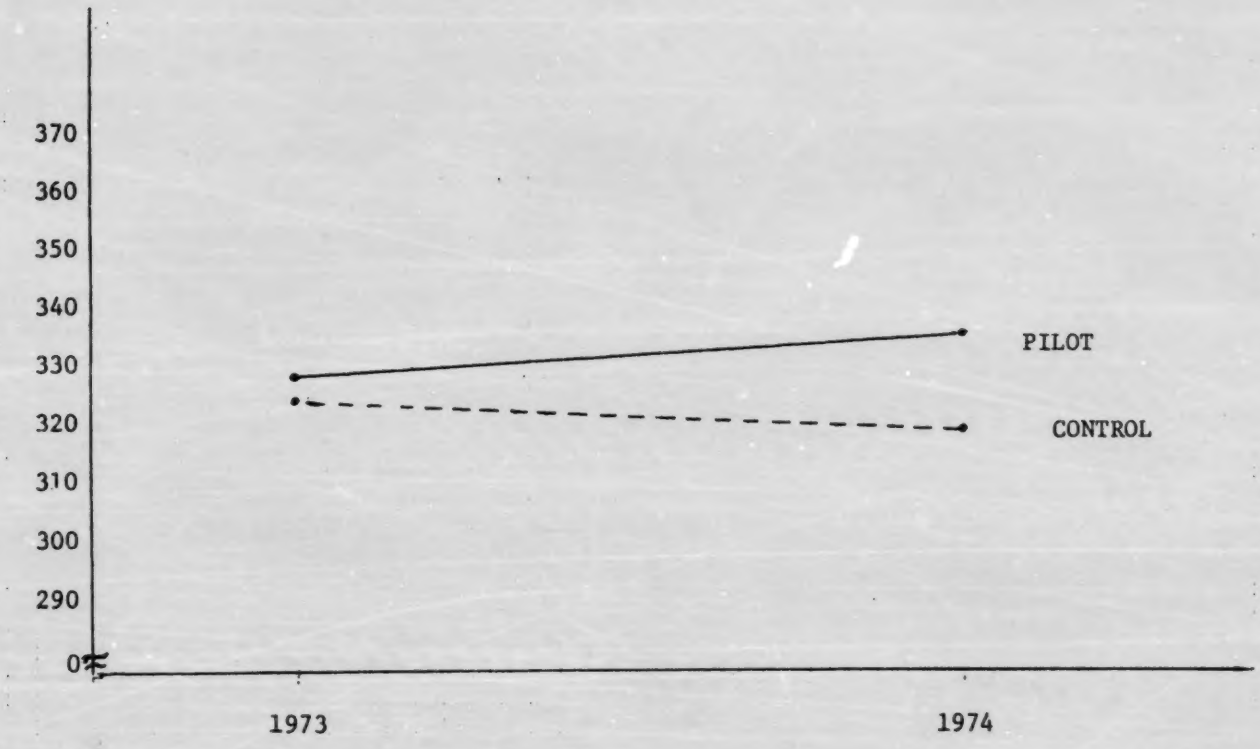
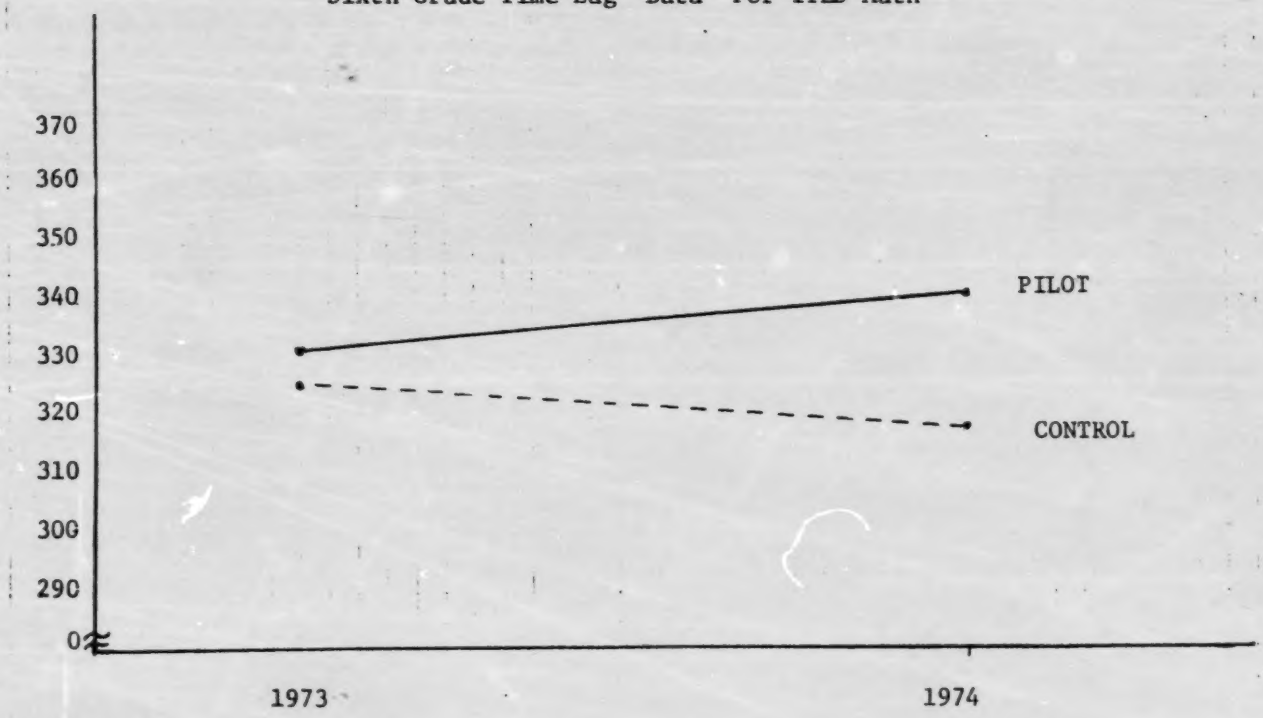


Figure 6

Sixth-Grade Time-Lag Data For ITED Math



1. Fourth-Grade Results

At the fourth-grade level, 1973 estimates for the pilot group are slightly higher than control group estimates for both reading and math. Estimates for 1974 reveal that the pilot group has retained its advantage in both areas. As seen in Figures 3 and 4, differences between pilot-group and control-group achievement are virtually the same for 1973 and 1974. When analyses of covariance (school means as the unit of analysis, 1974 estimates as criteria, and 1973 estimates as covariates) were used to adjust for 1973 differences between pilot and control groups, there were no significant differences between the 1974 fourth-grade estimates of pilot and control groups for either reading or math. Summaries of these analyses are presented in Tables 19 and 20.

Table 19

Analysis of Covariance Results for 1974 Fourth-Grade ITED Reading (1973 Fourth-Grade Reading as Covariate)

Source	df	SS(adj)	MS	F	p
Between Groups	1	1.4	1.4	.01	N.S.
Within Groups	3	318.6	106.2		
Total	4	320.0			

Table 20

Analysis of Covariance Results for 1974 Fourth-Grade ITED Math (1973 Fourth-Grade Math as Covariate)

Source	df	SS(adj)	MS	F	P
Between Groups	1	24.4	24.4	1.09	N.S.
Within Groups	3	67.1	22.4		
Total	4	91.5			

2. Sixth-Grade Results

At the sixth-grade level the pilot group showed a slight pre-treatment (1973) advantage over the control group in both reading and math. By the end of 1974 the pilot group's advantage had increased in both subject areas due to slight '73 to '74 increases for the pilot group as well as slight decreases for the control group. The increases in between-group differences appear in Figures 5 and 6, which clearly depict the widening achievement gap. Analysis of covariance results (Tables 21 and 22) show that even after adjusting for 1973 between-group differences the 1974 pilot-group estimates are significantly higher for mathematics ($p < .10$). Differences in 1974 sixth-grade reading achievement are significant only at the .20 level. It is highly possible, however, that if the student, instead of the school, had been used as the unit of analysis (and thereby greatly increasing the number of degrees of freedom in the significance tests) significant differences might have been detected.

Table 21

Analysis of Covariance Results for 1974 Sixth-Grade ITED Reading
(1973 Sixth-Grade Reading as Covariate)

Source	df	SS(adj)	MS	F	p
Between Groups	1	297.0	297.0	3.07	N.S.
Within Groups	3	289.9	96.6		
Total	4	586.9			

Table 22

Analysis of Covariance Results for 1974 Sixth-Grade ITED Math
(1973 Sixth-Grade Math as Covariate)

Source	df	SS(adj)	MS	F	p
Between Groups	1	346.5	346.5	9.13	$p < .10$
Within Groups	3	113.8	37.9		
Total	4	460.4			

3. Conclusion

The conservative conclusion to be drawn from the time-lag data presented above is that the "45-15" program seems to have had no adverse effects on reading or math achievement at either the fourth or sixth-grade levels. In fact, between the end of the 1973 school year and the end of the 1974 school year the gap between pilot and control groups seems to have increased at the sixth-grade level. It must be stated again, however, that such changes could be attributed to changes in the student population at this level, especially in light of the fact that 6th-grade achievement seems to have decreased for control schools.

C. Trait-Treatment Interactions

In order to assess possible interactions between certain student traits and type of school attendance schedule, various cross-product terms were included in the regression analyses. Specifically, the following combinations of variables were investigated for possible interactive effects:

Independent Variables	Dependent Variable
(1) Verbal Ability (SCAT-V) x School Schedule	Reading Achievement (STEP-R)
(2) Quantitative Ability (SCAT-Q) x School Schedule	Math Achievement (STEP-M)
(3) Attitude Toward Learning (ATL) x School Schedule	Reading Achievement (STEP-R)
(4) Attitude Toward Learning (ATL) x School Schedule	Math Achievement (STEP-M)
(5) Attitude Toward School (ATS) x School Schedule	Reading Achievement (STEP-R)
(6) Attitude Toward School (ATS) x School Schedule	Math Achievement (STEP-M)

The ability, attitudinal, and achievement estimates used to investigate possible trait-treatment interactions were the SCAT, IDEA, and STEP scores used in the analyses discussed above. The school schedule variable was coded 1 and 0 for pilot and control students, respectively.

Table 23 shows the regression equation computed for each analysis. Each of the regression weights has been standardized.

Significance tests showed that none of the interaction (cross-product) terms in the TTI analyses accounted for a significant proportion of achievement score variance. There were, however, some noticeable patterns which deserve mention.

Table 23

Regression Equations Computed for Trait-Treatment Interaction Studies

(1) STEP-R = .67 (SCAT-V) + .04 (SCHED) + .00 (SCAT-V x SCHED)

(2) STEP-M = .59 (SCAT-Q) - .13 (SCHED) + .19 (SCAT-Q x SCHED)

(3) STEP-R = .27 (ATL) + .29 (SCHED) - .21 (ATL x SCHED)

(4) STEP-M = .16 (ATL) + .23 (SCHED) - .12 (ATL x SCHED)

(5) STEP-R = .25 (ATS) + .36 (SCHED) - .27 (ATS x SCHED)

(6) STEP-M = .16 (ATS) + .33 (SCHED) - .21 (ATS x SCHED)

1. Aptitude

At high levels of quantitative ability there was a slight tendency for students in pilot schools to show greater math achievement than those in control schools, while at lower levels control-school students were slightly better. For reading achievement, differences between pilot and control groups increased very slightly at higher verbal ability levels (in favor of the pilot group). Tables 24 and 25 show descriptive statistics on reading and mathematics achievement and verbal and quantitative aptitude for pilot and control groups at various levels of ability. This descriptive information has also been displayed graphically in Figure 7. In general, it is probably unwise to attach any significance to the slight interaction effects noted above without further analysis and replication. Even if the interaction effects suggested above can be replicated with data collected in 1975, it is not certain whether the relatively small differences have practical implications.

Table 24

STEP Reading and SCAT Verbal Estimates for High, Middle, and Low Verbal Ability Students

Group	Test	SCAT Verbal Ability: High (>26) M	SD	Middle (20-26) M	SD	Low (<20) M	SD
Pilot	SCAT-V	33.0	5.5	22.5	1.8	15.3	3.1
	STEP-R	41.2	7.8	32.7	6.8	27.8	7.9
		(N=60)		(N=32)		(N=41)	
Control	SCAT-V	32.6	4.9	23.1	2.1	15.2	3.3
	STEP-R	39.9	8.6	31.6	6.6	27.6	8.8
		(N=53)		(N=54)		(N=54)	

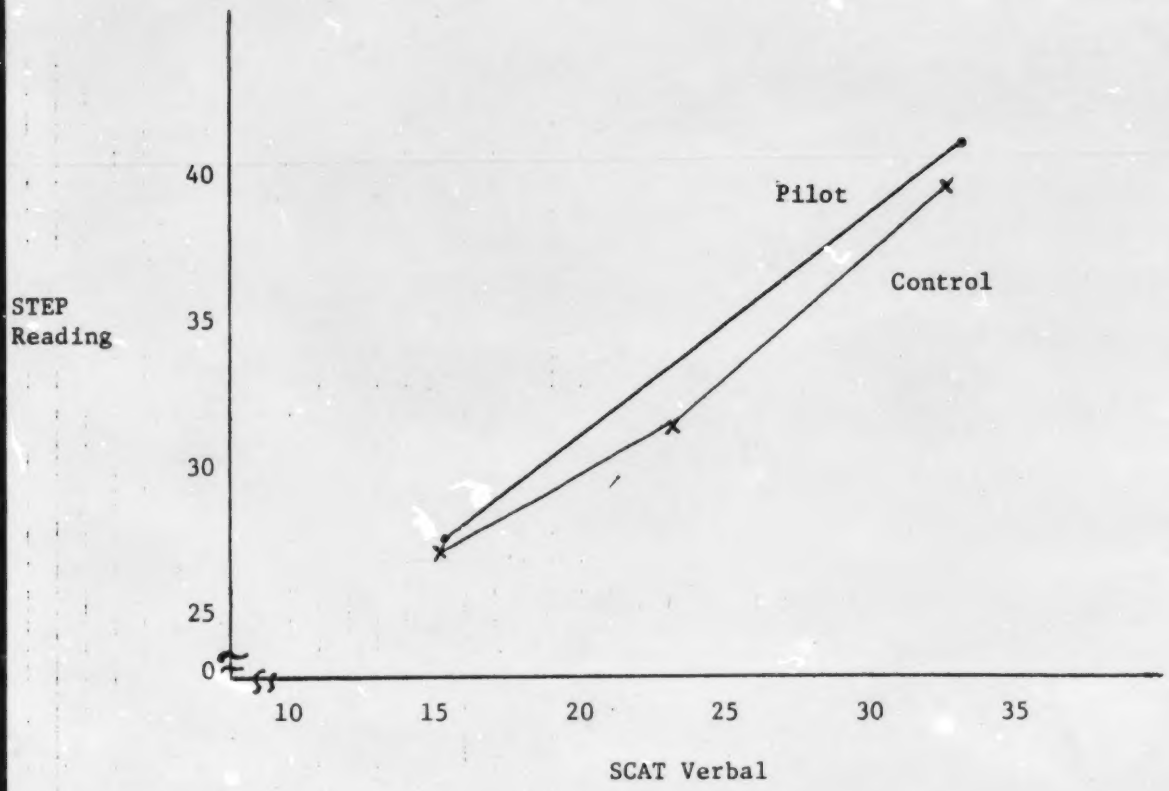
Table 25

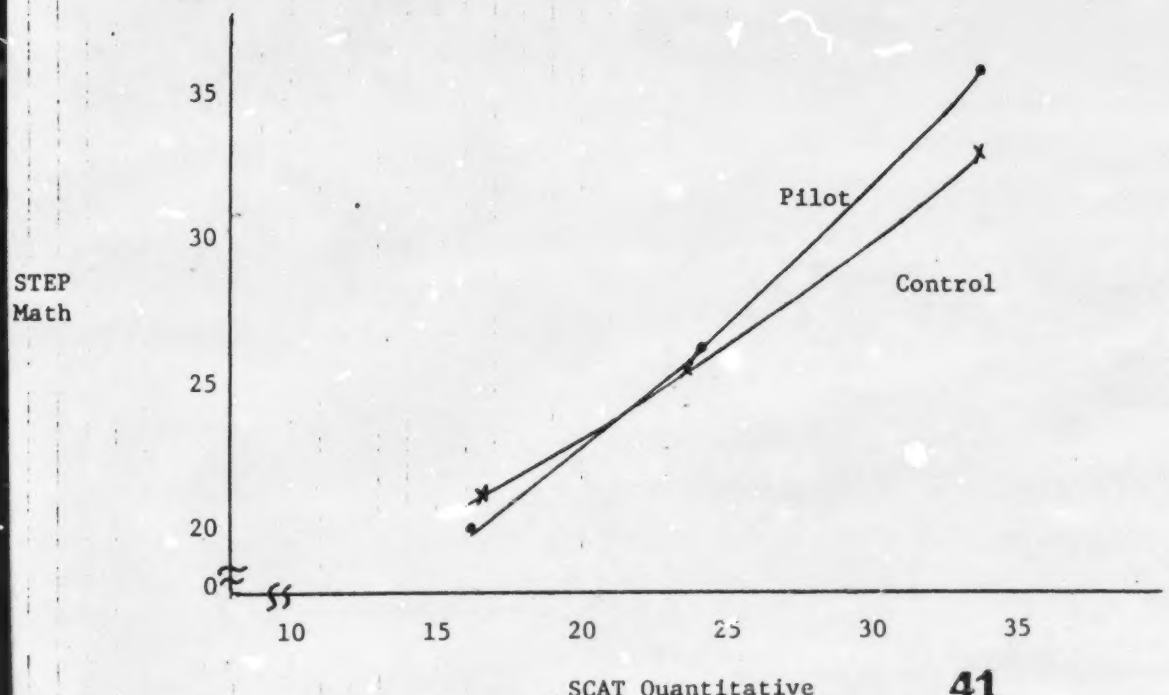
STEP Math and SCAT Quantitative Estimates for High, Middle, and Low Quantitative Ability Students

Group	Test	SCAT Quantitative Ability: High (>27) M	SD	Middle ((21-27) M	SD	Low (<21) M	SD
Pilot	SCAT-Q	33.8	4.2	24.1	1.8	16.2	3.2
	STEP-M	36.0	6.9	26.5	7.7	20.3	7.3
		(N=54)		(N=47)		(N=32)	
Control	SCAT-Q	33.8	4.6	23.5	1.9	16.6	3.2
	STEP-M	33.1	7.8	25.8	8.4	21.5	6.8
		(N=50)		(N=55)		(N=56)	

Figure 7

STEP Reading and Math Achievement Estimates at Various Levels of Verbal and Quantitative Ability





2. Attitudes

When student attitudes were considered as the trait variables in the TTI analyses, a consistent pattern was observed for each achievement and attitude-measure combination. Table 23 shows negative regression weights for each of the equations (3-6) presented. These weights and the descriptive data in Tables 26 and 27 suggest that differences in pilot and control-group achievement in both reading and math were more pronounced for students having relatively poor attitudes, especially attitude toward school. Trends are illustrated in Figures 8 and 9. From these data it appears that pilot-school students achieve at least as high as control school students at all attitude levels. This superiority, in general, diminishes at high levels of student attitude. However, it should be remembered that baseline (1973) achievement estimates showed pilot-group advantages. Therefore, it is conceivable that adjusting for initial differences in achievement would have resulted in different interaction patterns. For example, control-school students might have shown greater achievement than pilot school students at high attitude-levels.

In summary, the TTI analyses suggested the possibility of two patterns of trait-treatment interactions which require further investigation. It was suggested that ability may interact with school schedule in such a way as to favor year-round students at higher ability levels and that student attitudes may interact with schedule to favor year-round students at levels of poorer attitude.

Again it is suggested that confirmation of these findings be attempted with additional analyses and replication before they can be given much weight.

Table 26

STEP Reading, STEP Math, and Attitude Toward Learning (ATL) Estimates for High, Middle, and Low Attitude Students

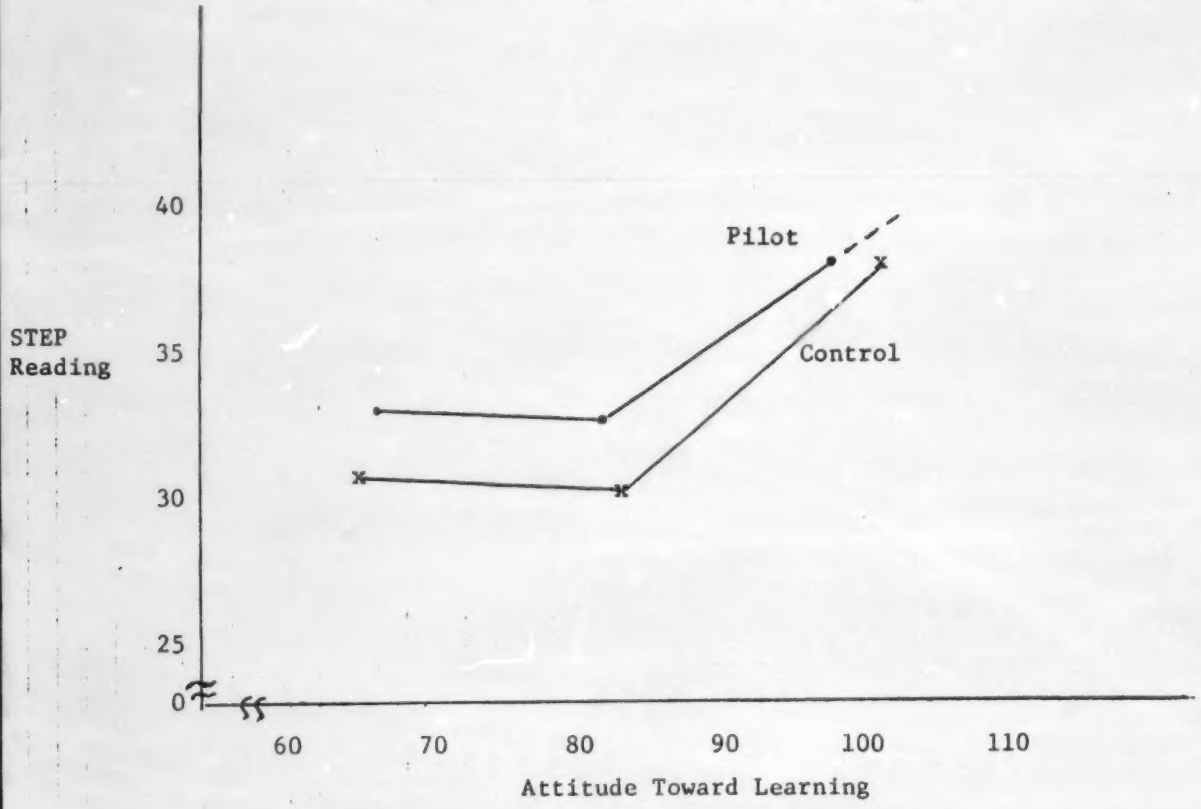
Group	Test	Attitude Toward Learning High (>88) M	SD	Middle (76-88) M	SD	Low (<76) M	SD
Pilot	ATL	97.6	6.7	81.4	4.0	66.0	8.0
	STEP-R	38.5	8.1	32.9	10.0	33.1	9.7
	STEP-M	31.1	8.9	27.5	10.0	27.8	9.6
		(N=49)		(N=44)		(N=40)	
Control	ATL	100.9	6.7	82.7	3.7	64.7	10.8
	STEP-R	38.0	8.6	30.3	9.7	30.8	8.6
	STEP-M	28.6	8.8	25.4	9.7	25.7	8.5
		(N=52)		(N=44)		(N=62)	

Table 27

STEP Reading, STEP Math, and Attitude Toward School (ATS) Estimates for High, Middle, and Low Attitude Students

Group	Test	Attitude Toward School High (>90) M	SD	Middle (74-90) M	SD	Low (<74) M	SD
Pilot	ATS	101.3	7.6	83.6	5.3	56.3	12.4
	STEP-R	36.5	8.6	33.7	10.9	34.8	9.1
	STEP-M	28.2	10.2	30.2	9.7	28.3	9.0
		(N=43)		(N=41)		(N=49)	
Control	ATS	103.3	6.9	81.5	5.0	54.7	14.6
	STEP-R	36.7	8.7	31.4	10.0	30.9	8.8
	STEP-M	28.9	9.1	24.8	8.8	25.9	8.7
		(N=55)		(N=54)		(N=52)	

Figure 8
-37-
STEP Reading and Math Achievement Estimates at Various Levels of Attitude Toward Learning



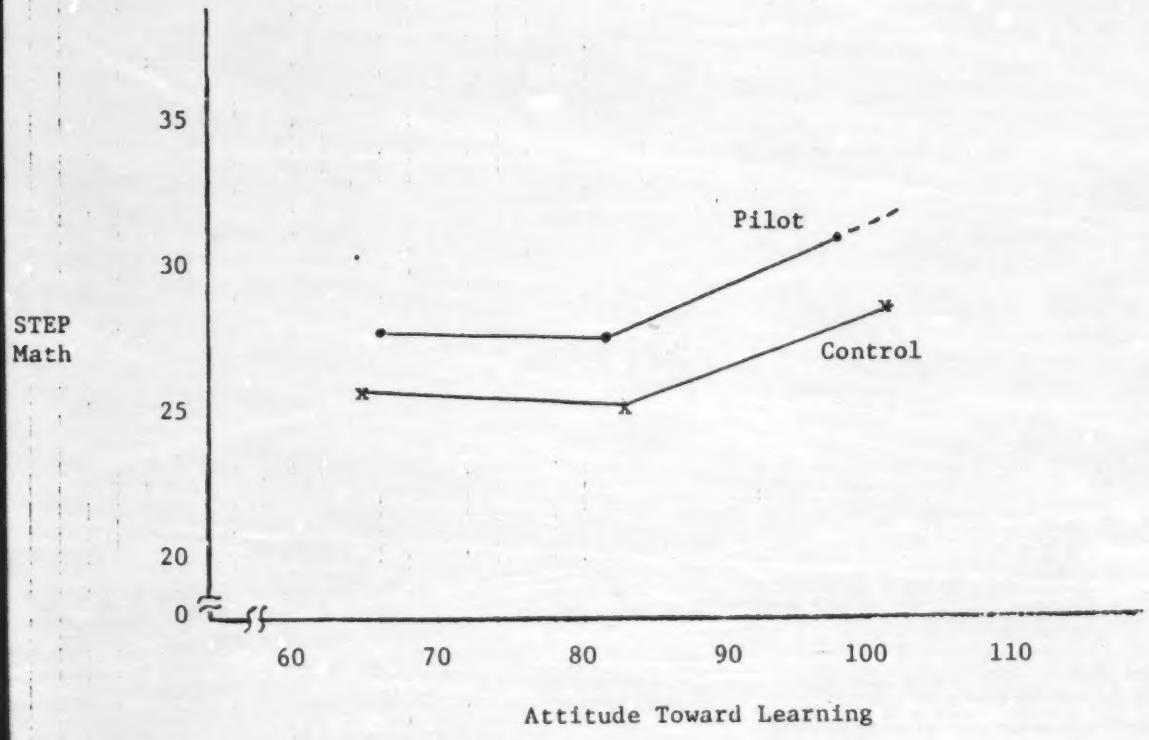
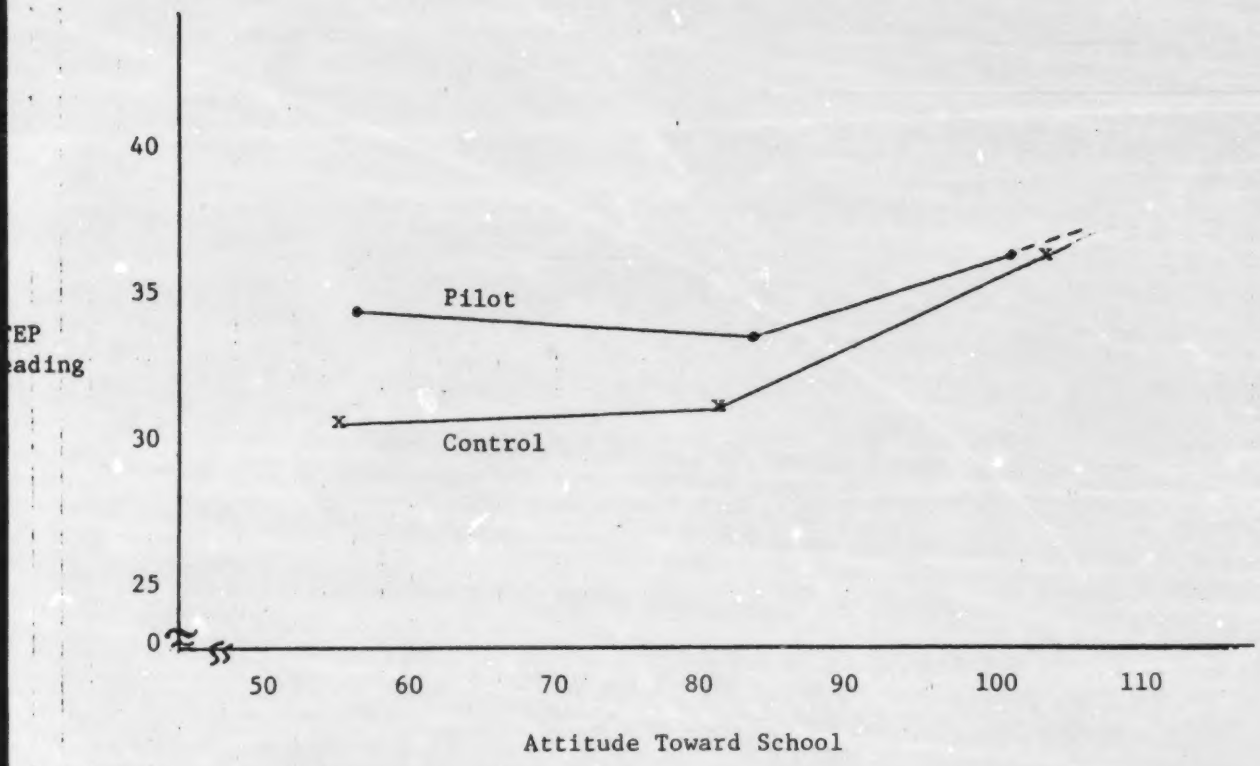
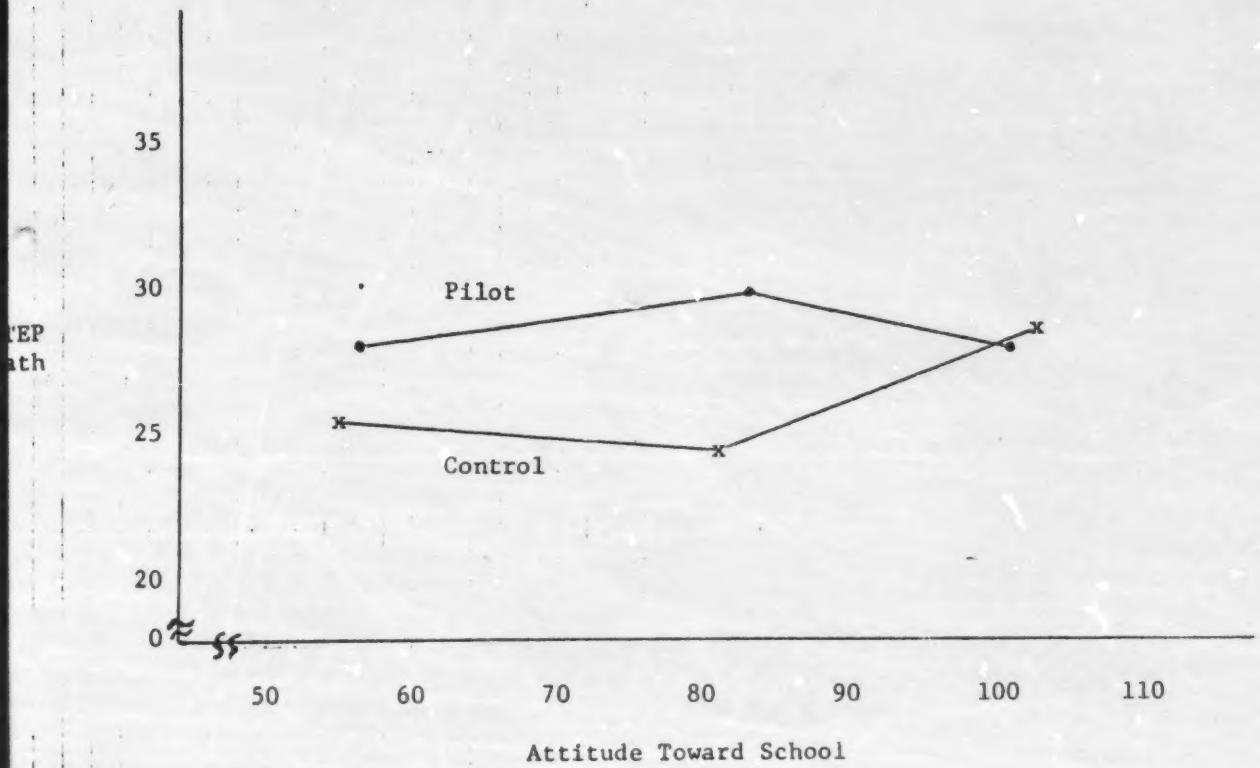


Figure 9
-38-
STEP Reading and Math Achievement Estimates at Various Levels of Attitude Toward School





D. First-Grade Study

As stated above, the purpose of the first-grade study was to assess the effects on readiness of the early beginning necessitated by the 45-15 schedule. In order to determine any effects on readiness, the Metropolitan Readiness Test scores of all 1973-74 first-graders in pilot and control schools were collected*. Classroom teachers administered the tests approximately 1-2 weeks after students began the first grade.

Since each of the four cycles of students in pilot schools begins first grade before control group students, pilot school students could be expected to be slightly younger than control school students. Table 28 which contains the distribution of ages of beginning first-grade students, confirms this expectation. In pilot schools, for example, nearly 17% of students were less than six years old when they were administered the Metropolitan Readiness Tests. Less than 2% of control school first-graders were younger than six years old, however. On the other hand, about 7% of pilot-school first-graders were 6 years, 9 months or older, while about 19% of control school students were in this age category. The median age for beginning pilot school first-graders was 6 years, 3 months; control school first-graders were about 2 1/2 months older, on the average.

Two other variables which were included in the first-grade study were sex and previous kindergarten experience. Previous research has suggested that both of these variables are related to readiness for instruction. Table 29 shows that nearly equal proportions of pilot and control first-graders (56% of pilot students and 51% of control students) had, as reported by first-grade teachers, attended kindergarten.

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* The scores of one of the four pilot schools were not received in time to be included in the analysis. Hence, results are based on data from two control schools and three pilot schools.

Table 28

Distribution of Age of Beginning First Grade
Pilot and Control Students at Time of
Metropolitan Readiness Test Administration

Group		Age						
		Less than 6 years old	6,0-6,2	6,3-6	6,6-6,8	6,9-6,11	7 years or older	Total
Pilot	N	46	81	64	67	14	5	277
	(%)	(16.6)	(29.2)	(23.1)	(24.2)	(5.1)	(1.8)	(100.0)
Control	N	3	41	36	51	27	4	162
	(%)	(1.9)	(25.3)	(22.2)	(31.5)	(16.7)	(2.4)	(100.0)
Total	N	49	122	100	118	41	9	439
	(%)	(12.2)	(27.8)	(22.8)	(26.9)	(9.3)	(2.0)	(100.0)

Table 29

Kindergarten Experience of Students
Beginning First Grade

Group	Kind. Exp.	No. Kind. Exp.
Pilot	154	123
Control	83	79
Total	237	202

In order to assess the relative contribution to readiness of sex, age, and kindergarten experience, a linear regression analysis was conducted using all three as independent variables and Metropolitan Readiness Test scores as the dependent variable. No distinction was made between pilot and control students. The equation which best predicted Metropolitan Readiness Test (MRT) scores was the following:

$$MRT = 9.21 + 3.69\ (SEX) + 8.11\ (KIND\ EXP) + .60\ (AGE)$$

where SEX = 0 for boys, 1 for girls
KIND EXP = 0 for no kind. exp., 1 for kind. exp.
and AGE = age in months.

The standard error of estimate was 15.57.

The mean MRT score for all first-graders for whom data were available was 61.1. Slightly more than 80% of first-graders scored 45 or above on the test. To give the reader some idea of the educational significance of these scores, the readiness status estimates (from the MRT technical manual) corresponding to various total score ranges have been summarized in Table 30 below. Thus about 80% of the first-graders in the sample were classified as average or better.

Table 30

Score Range	Readiness Status
Above 76	Superior; apparently very well prepared for first-grade work...
64-76	High normal; good prospects for success in first-grade work...
45-63	Average; likely to succeed in first-grade work...
24-44	Low normal; likely to have difficulty in first-grade work...
Below 24	Low; chances of difficulty high under ordinary instructional conditions...

From the regression equation given above, it is apparent that girls averaged about 3 or 4 points higher than boys. An age effect was also noted. On the average, there was nearly a two-point difference in MRT score for each three-month difference in age (i.e., .60 per month). By far the largest effect, however, was kindergarten experience. Students who were reported by their teachers as having attended kindergarten averaged about 8 points higher than students who had no record of kindergarten attendance. Although each of the three independent variables accounted for a significant ($p < .01$) portion of the variance of MRT scores, it is clear that kindergarten experience makes the greatest contribution to readiness.

Table 31 contains the descriptive statistics for MRT scores by various age intervals and kindergarten experience. This information is displayed graphically in Figure 10, which clearly shows the slight age gradient as well as the clear superiority of students having had the benefit of kindergarten experience. Curves presented in Figure 10 have been smoothed and weighted graphically to reflect differences in the number of students at each data point.

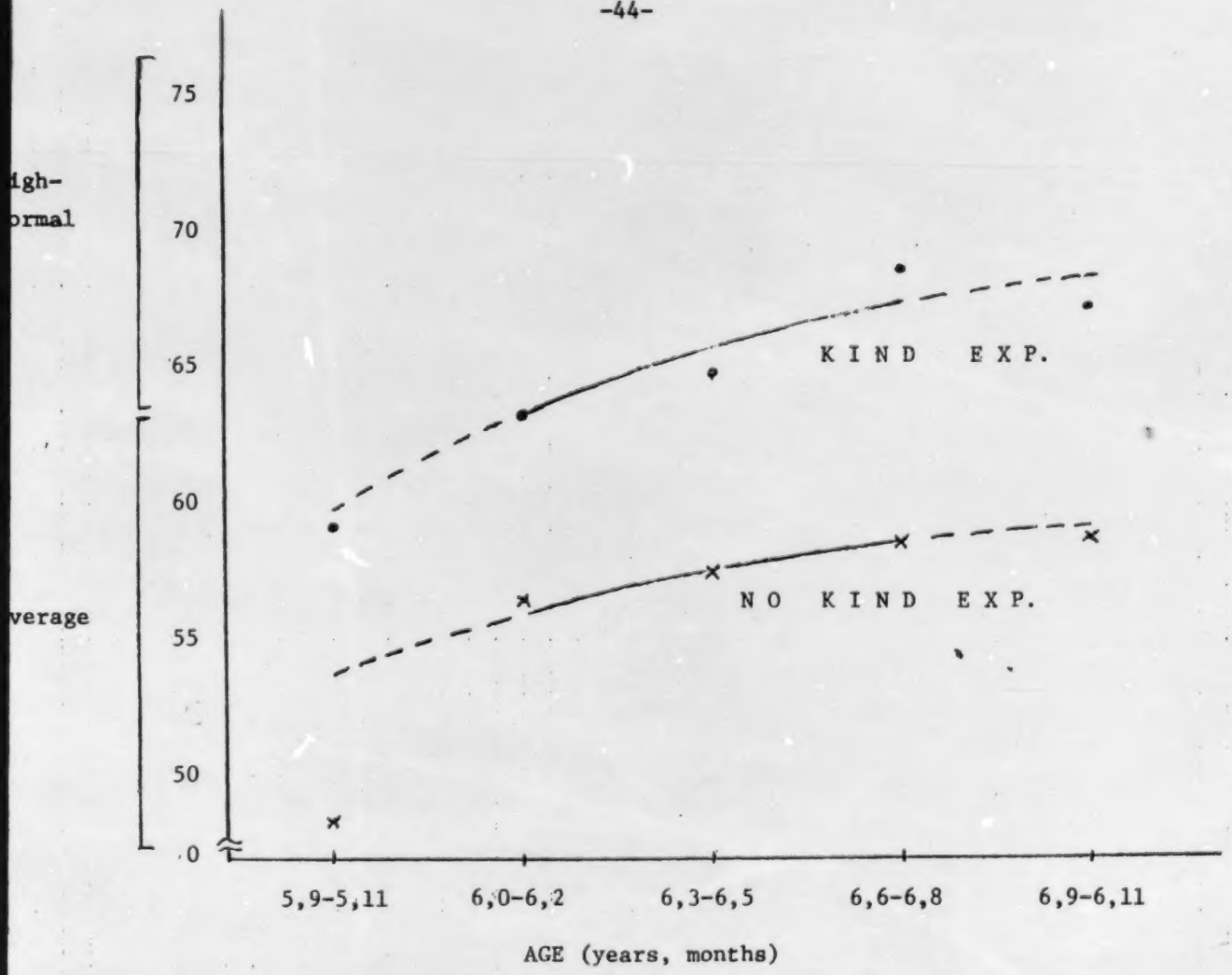
In conclusion, it seems that the 2-or 3-month average age difference between first-cycle pilot students and students in traditionally scheduled control schools is of minor importance, especially in light of the effects of previous kindergarten experience. There may be certain groups, e.g., boys who have not attended kindergarten, for whom differences in readiness that are attributable to age differences may be more critical.

Table 31

Metropolitan Readiness Scores by
Three-Month Age Intervals for
Beginning First-Grade Students

	Age					
Kind. Exp.	Less than 6 years old	6,0-6,2	6,3-6,5	6,6-6,8	6,9-6,11	7 years or older
	M S.D.	M S.D.	M S.D.	M S.D.	M S.D.	M S.D.
Yes	60.1 13.5 (N = 32)	63.1 15.5 (N = 72)	64.7 14.7 (N = 56)	68.7 13.4 (N = 52)	67.1 10.4 (N = 21)	60.8 8.7 (N = 4)
No	48.4 16.1 (N = 17)	56.5 17.9 (N = 50)	57.4 16.4 (N = 44)	58.5 18.6 (N = 66)	58.9 11.9 (N = 20)	62.0 12.0 (N = 5)

Figure 10
Metropolitan Readiness Test Scores for Students
Beginning First Grade



VI. SUMMARY

At the end of the first year of year-round education in four elementary schools, Virginia Beach City School District, end-of-fifth-grade achievement and attitudinal data were collected for students participating in the pilot program and for students in control (i.e., traditionally scheduled) schools. After adjustments were made for slight differences between pilot and control groups in previous (end-of-fourth-grade) achievement, aptitude, and number of school days in session, there were no significant differences between the two groups with respect to achievement in either reading or mathematics concepts.

After adjusting for initial (i.e., end-of-fourth-grade) between-group differences in attitude, there was no significant end-of-fifth-grade difference between pilot and control groups with respect to Attitude Toward Learning. With regard to Attitude Toward School, however, a significant difference in favor of the pilot group was detected.

Within the pilot group there were no significant end-of-fifth-grade differences among students in different attendance cycles with respect to reading achievement, mathematics achievement, attitude toward learning, or attitude toward school after adjusting for initial differences.

Fourth- and sixth-grade statewide assessment mathematics and reading achievement data were obtained in 1973 and 1974 for students in pilot and control schools. At the fourth-grade level, adjusting for slight 1973 between-group differences in fourth-grade achievement resulted in no significant 1974 differences in either reading or mathematics achievement.

At the sixth-grade level, however, even after adjusting for 1973 sixth-grade between-group achievement differences, there were slight 1974 differences in favor of pilot schools. The difference in mathematics achievement was significant at the .10 level; the difference in reading achievement was not significant.

Investigation of the interactive effects on student achievement of several student traits and type of school schedule suggested two patterns requiring further study. It was suggested that attitude may interact with school schedule in such a way that year-round scheduling may have more benefit for poor-attitude than high-attitude students. It was also suggested that year-round education may be slightly more beneficial to high-ability than low-ability students. It was pointed out that these small interaction effects need further investigation.

At the first-grade level, analyses of the readiness scores of beginning first-grade students in pilot and control schools were conducted. The relationship between readiness and age that was computed suggested that slight differences in readiness can be expected as a result of differences in age. For the two- or three-month average age difference that is likely between first-cycle year-round students and students in traditionally scheduled classes, the expected difference of one or two points in readiness is of minor importance. The relatively insignificant effect of this early first-grade beginning can be seen when it is compared to the average difference in readiness (8 points) between first-graders having attended kindergarten and those not having attended.

In conclusion, the students in the fourth, fifth, and sixth grades in pilot schools have apparently suffered no adverse effects on achievement in reading or mathematics as a result of year-round scheduling.

Some data even suggest that sixth-grade students may have benefited slightly from the year-round plan. Likewise, no adverse effects on student attitudes toward learning or toward school were noted. In fact, the data strongly suggest that year-round education may improve students' attitudes toward school.

Data also suggest that any positive effects of year-round education probably occur for students exhibiting poor attitudes toward learning and toward school and for relatively high-ability students.

First-grade readiness data suggest that the slightly earlier beginning for some year-round first-graders has only a minor effect on readiness for instruction

From the findings presented above, there appears to be no reason for hesitance in continuing or expanding year-round education in Virginia Beach. Decisions of this nature, however, will also be shaped by the results of the other two evaluation studies, i.e., the effects on cost and on community attitudes.